What is claimed is:

1. A non-destructive method for determining an amount of heat exposure to a resin-fiber composite substrate, the method comprising:

non-destructively determining a value I_s of infrared energy reflected by a surface on a composite substrate; and

correlating the value I_s of the infrared energy reflected to an amount of heat exposure.

2. The method of Claim 1, further comprising determining a value I_r of infrared energy reflected from a reference composite surface.

3. The method of Claim 2, further comprising comparing I_s with I_r.

4. The method of Claim 1, wherein determining I_s includes utilizing an infrared spectrometer.

5. The method of Claim 4, wherein the infrared spectrometer includes an infrared filter spectrometer.

6. The method of Claim 4, wherein the infrared spectrometer includes an ellipsoidal mirror collector.

7. The method of Claim 4, wherein the infrared spectrometer includes an attenuated total reflectance collector.

8. The method of Claim 4, wherein the infrared spectrometer includes at least two filters.

9. The method of Claim 8, wherein the at least two filters include narrow bandpass infrared filters.

10. The method of Claim 1, wherein determining I_s includes determining absorbance at at least one wavenumber corresponding with increased infrared absorbance by a composite exposed to heat.

11. The method of Claim 10, wherein the at least one wavenumber is around 2174 cm-1.

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12. The method of Claim 10, wherein the at least one wavenumber is around 2000 cm-1.

13. The method of Claim 10, wherein the at least one wavenumber is around 1783 cm-1.

14. The method of Claim 10, wherein the at least one wavenumber is around 1727 cm-1.

15. The method of Claim 10, wherein the at least one wavenumber is around 1767 cm-1.

16. The method of Claim 10, wherein the at least one wavenumber is around 1692 cm-1.

17. The method of Claim 10, wherein the at least one wavenumber is around 1678 cm-1.

18. The method of Claim 10, wherein the at least one wavenumber is around 1522 cm-1.

19. The method of Claim 10, wherein correlating the infrared absorbance to an amount of heat exposure of the sample includes determining a difference between infrared absorbance of the sample at at least two wavenumbers.

20. The method of Claim 19, wherein the at least two wavenumbers are around 1522 cm-1 and around 1678 cm-1.

21. The method of Claim 19, wherein the at least two wavenumbers are around 1629 cm-1 and around 2174 cm-1.

22. A non-destructive method for determining an amount of heat damage to a resin-fiber composite sample, the method comprising:

transmitting an infrared beam onto a sample of a resin-fiber composite;

detecting a reflected infrared beam reflected by the sample;

determining infrared absorbance of the sample; and

correlating the infrared absorbance to an amount of heat damage to the sample.

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23. The method of Claim 22, wherein transmitting an infrared beam includes transmitting the infrared beam in a direction approximately parallel with fibers in the sample.

24. The method of Claim 22, wherein determining the infrared absorbance includes using an infrared spectrometer.

25. The method of Claim 22, wherein correlating the infrared absorbance includes determining absorbance at at least one wavenumber corresponding with an infrared spectra of a heat damaged resin-fiber composite surface.

26. The method of Claim 25, wherein the at least one wavenumber is around 2174 cm-1.

27. The method of Claim 25, wherein the at least one wavenumber is around 2000 cm-1.

28. The method of Claim 25, wherein the at least one wavenumber is around 1783 cm-1.

29. The method of Claim 25, wherein the at least one wavenumber is around 1727 cm-1.

30. The method of Claim 25, wherein the at least one wavenumber is around 1767 cm-1.

31. The method of Claim 25, wherein the at least one wavenumber is around 1692 cm-1.

32. The method of Claim 25, wherein the at least one wavenumber is around 1678 cm-1.

33. The method of Claim 25, wherein the at least one wavenumber is around 1522 cm-1.

34. The method of Claim 35, wherein correlating the infrared absorbance to an amount of heat damage of the sample includes deriving a difference between infrared absorbance at at least two wave numbers.

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35. The method of Claim 34, wherein deriving a difference between infrared absorbance of the sample at at least two wavenumbers includes deriving a difference between infrared absorbance at around 1522 cm-1 and at around 1678 cm-1.

36. The method of Claim 34, wherein deriving a difference between infrared absorbance of the sample at at least two wavenumbers includes deriving a difference between infrared absorbance at around 1692 cm-1 and at around 2174 cm-1.

37. The method of Claim 22, wherein detecting a reflected infrared beam reflected by the sample includes filtering the reflected infrared beam.

38. The method of Claim 37, wherein filtering the reflected infrared beam includes utilizing at least two filters.

39. A non-destructive method for determining an amount of heat exposure of a resin-fiber composite sample, the method comprising:

transmitting an infrared beam onto a sample of resin-fiber composite;

detecting a reflected infrared beam reflected by the sample;

determining a first infrared absorbance of the sample from the reflected infrared beam at a first wavenumber;

determining a second infrared absorbance of the sample from the reflected infrared beam at a second wavenumber;

deriving a first difference between the first infrared absorbance and the second infrared absorbance; and

quantitatively determining a amount of heat exposure by correlating the first difference to a reference sample.

40. The method of Claim 39, wherein correlating the first difference to a reference sample includes comparing the first difference with a second difference of infrared absorbance at the first wavenumber and the second wavenumber for the reference sample.

41. The method of Claim 39, wherein determining at least one of the first infrared absorbance and the second infrared absorbance includes using an infrared spectrometer.

42. The method of Claim 41, wherein the infrared spectrometer includes an infrared filter spectrometer.

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43. The method of Claim 42, wherein the infrared spectrometer includes at least two filters.

44. The method of Claim 43, wherein the filters include narrow bandpass infrared filters.

45. The method of Claim 41, wherein the infrared spectrometer utilizes an ellipsoidal mirror.

46. The method of Claim 41, wherein the infrared spectrometer utilizes attenuated total reflectance.

47. The method of Claim 39, wherein the first wavenumber and the second wavenumber correspond with an infrared spectra of a heat damaged composite surface.

48. The method of Claim 47, wherein the first wavenumber is around 1522 cm-1.

49. The method of Claim 47, wherein the second wavenumber is around 1678 cm-1.

50. The method of Claim 47, wherein the first wavenumber is around 1692 cm-1.

51. The method of Claim 47, wherein the second wavenumber is around 2174 cm-1.

52. A non-destructive method for determining a degree of heat exposure of a resin-fiber composite substrate, the method comprising:

transmitting an infrared beam onto an resin-fiber composite substrate;
filtering with a first filter a reflected infrared beam reflected by the substrate;
detecting a first filtered portion of the reflected infrared beam; and
determining a first infrared absorbance of the substrate.

53. The method of claim 52, further comprising correlating the first infrared absorbance a degree of heat exposure.

54. The method of claim 52 wherein determining a first infrared absorbance includes determining absorbance at a wavenumber of around 2174 cm-1.

55. The method of claim 52 wherein determining a first infrared absorbance includes determining absorbance at a wavenumber of around 2000 cm-1.

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56. The method of claim 52 wherein determining a first infrared absorbance includes determining absorbance at a wavenumber of around 1783 cm-1.

57. The method of claim 52 wherein determining a first infrared absorbance includes determining absorbance at a wavenumber of around 1727 cm-1.

58. The method of claim 52 wherein determining a first infrared absorbance includes determining absorbance at a wavenumber of around 1767 cm-1.

59. The method of claim 52 wherein determining a first infrared absorbance includes determining absorbance at a wavenumber of around 1692 cm-1.

60. The method of claim 52 wherein determining a first infrared absorbance includes determining absorbance at a wavenumber of around 1678 cm-1.

61. The method of claim 52 wherein determining a first infrared absorbance includes determining absorbance at a wavenumber of around 1522 cm-1.

62. The method of Claim 52, further comprising:
filtering with a second filter a reflected infrared beam reflected by the substrate;
detecting a second filtered portion of the reflected infrared beam; and
determining a second infrared absorbance of the substrate.

63. The method of Claim 62, further comprising subtracting the second infrared absorbance from the first infrared absorbance.

64. The method of claim 62 wherein determining a first infrared absorbance includes determining absorbance at a wavenumber of around 1522 cm-1, and determining a second infrared absorbance includes determining absorbance at a wavenumber of around 1678 cm-1.

65. The method of claim 62 wherein determining a first infrared absorbance includes determining absorbance at a wavenumber of around 1692 cm-1, and determining a second infrared absorbance includes determining absorbance at a wavenumber of around 2174 cm-1.

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